

leaves; *S. Dayi* also lacks the toothed cartilaginous edge. It is curious that both *S. minima* and young plants of *S. borneensis* on G. Panti are parasitised by a scale insect, such being uncommon on wild ferns in this country.

Notes on Malayan Ferns

1. *Dipteris Lobbiana*.

This interesting fern has a wide distribution in Malaysia and is quite abundant, at least over part of its range, but probably because of its peculiar habitat it was not often found by the earlier collectors. In Christ's *Farnkräuter der Erde* (1897) it is said to be a rare plant. Its collection on Mount Ophir by Lobb, together with *Matonia pectinata*, with which it probably has a common ancestry, has associated the names of the two ferns together, though in nature they do not grow side by side. *Matonia pectinata* is found on the exposed summits of a number of the highest mountains in the Malay Peninsula and at lower altitudes on some of the small islands to the south of it; *Dipteris Lobbiana* is found only on rocks by the sides of forest streams, often quite in the low country. It has been found plentifully by several streams in Johore, as well as on Mount Ophir, and also further north in Pahang (Tahan River and Sungei Perting, Bentong), in Perak (abundantly in the Palas River on Gunong Bujong Malacca, and at other localities not specified) and as far north as Kedah Peak. In Borneo Bishop Hose has stated that it is found "on the banks of most rivers in Sarawak and North Borneo at some distance above the highest point to which the influence of the tide extends." van Alderwerelt van Rosenburgh gives the distribution "Malaya," a term to which he attaches a wide meaning. Copeland records it as occurring in Celebes, but the writer has seen no published record of its occurrence in Sumatra or Java, though the former is not unlikely. It is not found in the Philippines.

The present writer has seen this fern three times, on all occasions in Johore; by the Sungei Berhidong, north of Gunong Belumut, at about 450 feet above sea level, by one of the streams flowing southwards from Gunong Pulai (see accompanying plate), at a similar altitude, and in the Pelepah valley near Kota Tinggi. In descending the first-named stream from about 1600 ft., *Dipteris* was not observed in the steeper more shaded upper reaches, but appeared where the course became more level and open. The beds of all three streams are filled with granite boulders of greatly varying size; the fern grows over the boulders, its rhizomes clinging tightly to them. Sometimes by the side of the stream the boulders are covered with sand or silt, and in this case the rhizome is not

exposed; in such positions, on the edge of the jungle beside the stream, the fronds reach their largest size. The plant grows everywhere quite close to the water, sometimes on rocks in mid-stream, and it is evident that at times of flood the fronds are quite submerged. After heavy rain (which may occur at almost any time of year) such streams rise rapidly to a height considerably above their normal level. Burkill remarks of *Dipteris Lobbiana* at Bentong that "the tenacity with which it holds on to the rocks is remarkable. It grows in places where the floods must often submerge it" (note on field label). The division of the frond into narrow segments is undoubtedly of great service under such conditions; it could hardly survive if it had the broad lamina of *D. conjugata*. Further, the narrow coriaceous leaflets are a xerophytic character probably connected with the fact that the fern often grows exposed to the sun, and may be left with a restricted water supply when the stream is low.

Another fern growing under the same conditions is *Meniscium salicifolium* Wall. (*Dryopteris* C. Chr.). Its narrow entire coriaceous leaflets are quite comparable with those of *Dipteris Lobbiana*, though it has pinnate leaves and a short rhizome instead of a long creeping one. It has the same kind of relation to the broad leaved *M. cuspidatum* Bl. (which has a wider distribution) as *D. Lobbiana* has to *D. conjugata*. A third species, which is almost certainly of the same habitat, is *Aspidium semibipinnatum* Wall., from the south of the Malay Peninsula and Borneo. It has narrow ribbon-like leaflets in contrast to the broad pinnae of its allies which live in the shade of the jungle. These ferns are undoubtedly specialised to the stream bed habitat, and are not found elsewhere.

Borneo appears to be the centre of distribution of the genus *Dipteris* as it exists today, and has two peculiar species. One of these, *D. quinquefurcata* (Bak.), is very close to *D. Lobbiana*; in fact, the writer is disposed to doubt whether it is a distinct species. On the banks of the Pelepah stream above mentioned, somewhat in the shade of the edge of the jungle, were some very large fronds of *D. Lobbiana*, twice as big as many of those on the rocks in the stream bed. In these there is a very marked tendency for the sori to break up into as many as five or six smaller ones in a single areola, and the segments of the fronds reach 9 cm. in width. This condition is almost that described for *D. quinquefurcata*, and it is quite possible that the latter species, known from few specimens with little or nothing in the way of field notes, only represents an unusually large form of *D. Lobbiana*, grown under unusually favourable conditions.

Bower has suggested *Land Flora* (1908) pp. 618-622, *The Ferns* (1923) p. 226) that *D. Lobbiana* is the most primitive

member of the genus, most nearly allied to the ancestral *Matonia-Gleichenia* type. Its simple narrow divisions with a single row of rather large sori on either side of the midrib, and the fact that all sporangia in a sorus are produced simultaneously whereas the sorus of *D. conjugata* is "mixed," all point to a relatively primitive condition. At the same time it is rather remarkable that *D. Lobbiana* is so well adapted to the conditions of the peculiar habitat in which alone it appears capable of living in nature. One must suppose that it is derived from an ancient type, and has retained its primitive characters on account of their suitability to its environment. It is evidently unable to grow either in the shade of the jungle or on exposed ground away from streams; in the latter position it would be crowded out by more vigorous competitors. *D. conjugata*, on the other hand, may be regarded as a more recent and vigorous type, capable of holding its own under conditions in which it has far more competitors; it has a correspondingly wider range of distribution.

2. On the production of fertile fronds by *Stenochlaena palustris*.

Stenochlaena palustris (Burm.) Bedd is a fern of wide distribution in the eastern tropics, extending from northern India and southern China through the Malayan region to Australia and into the Pacific. In Singapore it is one of the commonest ferns, especially in somewhat moist places, being frequent by roadside ditches. It will flourish with its fronds fully exposed to the sun and its stems trail long distances over the ground or climb high up tree trunks. The young fronds are tender, and are edible, but the old ones are very stiff and leathery. Usually only the sterile leaves are produced, but from time to time the narrow fertile leaves may be observed, occasionally in large numbers.

The question arises as to what are the factors determining the development of the fertile fronds. Over part, probably most, of its range, this fern is subjected to a more or less prolonged dry season. I can find no records of its behaviour under such circumstances, but it seems probable that fertile fronds are produced during the dry season, and sterile fronds only or chiefly during the wet season. Where there is a dimorphism between the sterile and fertile leaves of terrestrial ferns it is usual for the fertile to have a more or less contracted lamina, and a longer stipe, thus exposing the sporangia to a drier air than is found close to the ground, and also guarding to some extent against the consequent greater transpiration (see Copeland E. B., on the comparative ecology of the San Ramon Polypodiaceae, *Philippine Journal of Science*, C., Vol. 2, pp. 59-61). *Stenochlaena* is not essentially terrestrial, and the dimorphism is here connected most probably with a drier season, not with a drier stratum of the

atmosphere. However, there appears to be a response to the greater dryness of the air away from the ground in the production of a greater number of fertile fronds on those stems which have climbed up tree trunks; but fertile fronds are not confined to such situations, being found on the ground also.

In Singapore we have such a uniform climate that this fern has not any definite seasonal stimulus to the production of fertile fronds. The most marked wet season is usually that of the north-east monsoon, about November to January; there is usually hardly so marked a dry season, and therefore what must be supposed to be the stimulus of change from wet to dry is not often a strong one. Probably any fairly pronounced dry period will initiate the production of fertile fronds, and a very wet period a crop of sterile ones.

From the few observations I have made in Singapore it seems probable that a period of about twelve days or more with little or no rain is sufficient to induce the production of fertile fronds on some at least of the plants of this species. The position of the plant has no doubt some influence on the matter. By the time the fronds have developed the weather may be wet again. The fertility of a frond must be determined at a very early stage, while it is still coiled up in its bud, covered by overlapping dark coloured orbicular scales. I have not been able to determine exactly at what stage the form of the fronds is determined; I have only observed the production of fertile fronds on certain plants constantly under notice, and have examined the rainfall records of the preceding few weeks.

My attention was first called very strikingly to this matter in March 1923. After the wet and cloudy weather of the N. E. monsoon there came an unusually prolonged drought. From Jan. 24 to Feb. 17 there was only .4 in. of rain, nearly all of which fell on one day; on Feb. 18 there fell 1.28 in.; from Feb. 19 to March 13 only 1.7 in. During March and April there was a great abundance of fertile fronds of *Stenochlaena palustris* in the Gardens, and also on some plants outside which I happened to notice. There was a less pronounced dry period from August to October, and again abundant fertile fronds, but I have no particular observations.

1924 was much wetter than 1923, and fertile fronds were fewer. The following are observations of their appearance: March 10; a few young fertile fronds observed. The second half of February had been dry, (.88 in.) after an excessively wet first half (14.7 in.). Early June; fertile fronds on several plants. There had been a dry period from April 26 to May 7 (.21 in.)

August 18; fertile fronds on several plants. The period July 14 to 26 had been dry (.10 in.).

Feb. 1, 1925; 16 fertile fronds on one plant, and many on other plants also. The period Dec. 23 to Jan. 4 had been dry, eight of these days being quite rainless, and a period of seven days having only .10 in. of rain. January was very wet, and on Feb. 10th a large number of new sterile fronds were seen unfolding. It is curious that the young sterile fronds are always pink (like the young leaves of many trees), whereas the young fertile fronds are green.

These observations are not very complete, but they appear to be of some interest. It is remarkable how little biological observation is recorded concerning the majority of our ferns; even information as to habitat is usually missing from systematic works. It is only the more remarkable species, such as the *Platycteriums*, *Lecanopteris* and *Drynaria* which have received attention, but there is much of interest to be recorded about species less remarkable from a morphological standpoint.

3. *Gleichenia opposita* v.A.v.R.

In various places on the lower slopes of the hills of Penang a peculiar *Gleichenia* is abundant. There are two old specimens in the Singapore Herbarium, collected by Curtis (no. 534, fertile) and Ridley (7037), and another has been added by the present writer (10286). It has recently been observed fairly abundant on the lower slopes of Kedah Peak, and was also collected at Semenyih in Selangor by H. L. Hume in 1922 (F. M. S. Museums no. 8327).

Mr. H. N. Ridley in his recent paper on the ferns of the Malay Peninsula (Journ. Malayan Branch, R. Asiatic Society, Vol. 4, p. 3) has described it as a new species, *G. parallela*. I find however that the type collection of *G. opposita* v.A.v.R. from Sumatra (which I have examined, by courtesy of the Curator of the Buitenzorg Herbarium) is identical, so that the latter name must be adopted (Bull. Jard. Bot. Buitenzorg, Series 2, XI, 13, 1913). The species is one of considerable interest, and as it appears to me that both the descriptions above mentioned are somewhat inadequate I have prepared the following notes on it. In dealing with the fronds of *G. linearis* and its allies with their manifold forking (with or without development of the included buds) the usual terminology of pinna and pinnula becomes a little difficult to apply. For convenience I have here regarded each leaf as a branch system and have adopted the term pinna only for the ultimate leafy branchlets.

The main lateral branches of the fronds of this fern appear at first sight to be regularly bipinnate, with opposite pairs of pinnae, something like a form of *G. glauca* with the pinnulae (in the strict sense) opposite and widely spaced. A closer examination shows that a bud is present in the axil of one pinna of each pair,

on alternate sides of the rachis, and that the pinnae subtending these buds are larger than those opposite. The pinnae have exactly the same form as the ultimate branches of some forms of *G. linearis*; the pinnulae are closely set and densely ferruginous-hairy beneath, especially on the costulae. Comparing the branching of this fern with that of typical *G. linearis*, the homologies of the various parts are obvious. The axils where buds are present really represent forkings of the rachis, the forking being here unequal; one branch continues the growth of the branch-system, while the other is leafy like the ultimate branches of *G. linearis*. The opposite smaller "pinna" is one of the accessory branches usually present at the forkings of *G. linearis*, the other one being suppressed.

This condition of the apparent existence of two opposite pinnae is frequently found in the commonest of the smaller forms of *G. linearis* occurring in the Malay Peninsula. Fig. 1 shows diagrammatically the typical symmetrical branching of the common large form, fig. 2 a frequent type of branching in the small form just mentioned (which is very irregular) and fig. 3 the branching of *G. opposita*. In fig. 2 it is seen that at the penultimate forking the pseudopinnate condition occurs; it may also occur lower down the branch-system, though less frequently. Sometimes there is some development of the suppressed accessory branch, which may be represented merely by a rather long and slightly lobed pinnule.

On examining a number of complete fronds of *G. opposita* it is found that various irregularities in its branching may occur, and that these are all tending to the condition of the variety shown in fig. 2. The principal irregularities are as follows. Two of them are indicated in fig. 4.

(1). The suppressed accessory branch at any forking may be developed, either in a rudimentary form, or more rarely of normal size. These rudimentary accessory branches are common in other forms of *G. linearis*, as mentioned above.

(2). At any forking the smaller branch may be again forked instead of simple, with or without development of the extra accessory branch.

(3) The bud in any fork may develop, forming a short branch, forking once or twice again. At these subsidiary forkings small accessory branches may be developed.

(4). It not infrequently happens that the lowest bud on the lateral branch-system of a large frond develops into a strong axis, only slightly less in size than the main axis, bearing at its forkings lateral branch-systems exactly like those of the main axis, though somewhat smaller. In the branch systems of these subsidiary axes I have observed the same irregularities as those of the branch-systems of the main axis just described.

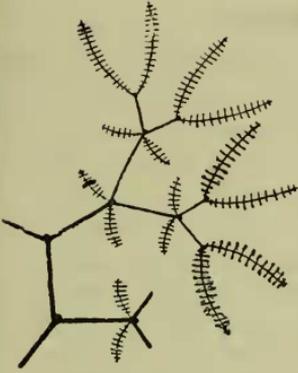


Fig. 1. Branching of normal *G. linearis*.

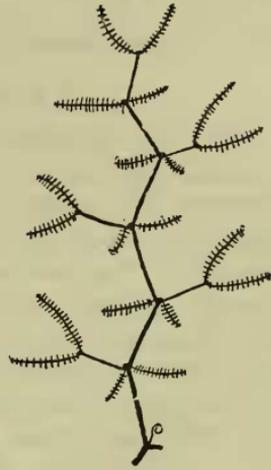


Fig. 2. Branching of a common form of *G. linearis*.

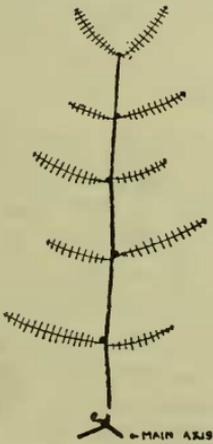


Fig. 3. Branching of *G. opposita*.

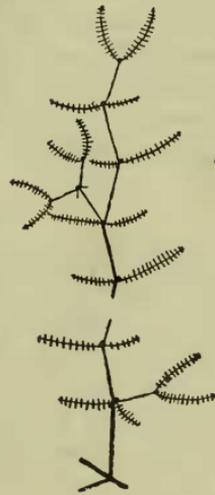


Fig. 4. Two abnormalities observed in *G. opposita*.

These irregularities all point to a close relationship with *G. linearis*; further, the fertile fronds show an arrangement of sporangia agreeing with *G. linearis*, 12 to 20 sporangia being present in each sorus.

4. *Syngamma borneensis* and *Lindsaya borneensis* in the Malay Peninsula.

On a recent visit to Gunong Panti, in the south-east of Johore, I found *Syngamma borneensis* (Hk.) J. Sm. and *Lindsaya borneensis* Hk. quite abundant in the low forest on the top of the sharp ridge which forms the hill. The altitude is about 1500 feet above sea. *Syngamma borneensis* grew on the ground, and also in rock crevices. Most of the plants bore fertile fronds, which were decidedly longer and narrower than the sterile ones. The species has not previously been recorded from the Malay Peninsula, but two specimens from Mt. Ophir collected by Mr. Ridley (3334 and 9079) have been found in the Singapore Herbarium. Mr. Ridley, in his paper on the ferns of the Malay Peninsula (*Journ. Malayan Branch, R. Asiatic Soc.*, Vol. 4, p. 111) appears to refer these specimens to *Elaphoglossum melanostictum*, but they are evidently to be referred here, though they are large (fertile fronds to 60 cm. long).

Lindsaya borneensis is otherwise represented in the Singapore Herbarium only by two specimens from Singapore Island, though Beddome records it as collected by Scortechini in Perak. Mr. Ridley's 3062 from Taiping Hills and 12132 from G. Pulai, which he records as this species, have much larger leaflets and are to be referred to *L. lancea*; his specimen from the Talan River has not been found here.

5. *Syngamma Dayi*.

Syngamma Dayi Bedd. is a very small species first collected by Day, on quartz rocks "on the pass between Kuala Kangsar and Kinta, 2000 ft. alt." The exact position of this locality is a little doubtful. The species has now been collected again on Klang Gates (by H. L. Hume, F. M. S. Museums no. 7149). Klang Gates is a ridge of quartzite in Selangor, the highest point of which is about 1400 feet above sea level. On its upper slopes grow many interesting xerophytic plants, a list of which is given by Mr. H. N. Ridley in the F. M. S. Museums Journal, Vol. 10, pp. 247-251 (1922). Mr. Ridley also records *S. Dayi* from Kanching, Selangor, in his recent paper of the ferns of the Malay Peninsula.

6. *Lindsaya lancea* and *L. scandens*.

Lindsaya lancea (L.) is a species of wide distribution in the tropics of both the old world and the new, while *L. scandens* Hk.

is recorded as confined to the Malayan region. The distinction between the two is sharp enough if extreme forms be considered; the one terrestrial with compound fronds, the other climbing with simple fronds. But if a large series be examined, it becomes impossible to recognise a distinction between them, and I think that *L. scandens* is a habit-form of *L. lancea*.

Climbing plants may be found bearing unbranched leaves typical of *L. scandens*, and (on the same stem) branched leaves which cannot be distinguished from leaves borne by terrestrial plants with short creeping stems. The terrestrial plants may have fronds with few branches and large pinnules, or many branches and smaller pinnules, and no line can be drawn separating them. The pinnules may have a slightly recurved lower edge, especially if large, or a straight one, in both scandent and creeping forms. The stems of both forms have exactly the same type of stiff dark brown lanceolate scales; but it is to be noted that the scales of *L. repens* are quite similar, so that scales are not to be relied on as specific characters in this genus. The roots on climbing stems are short and serve partly to attach the stem to its support; they are densely covered with root hairs. The roots of terrestrial stems are longer and stouter, and usually have lost their hairs in herbarium specimens, but types more or less intermediate may be found.

van Alderwerelt van Rosenberg says of *L. lancea* in the Supplement to his Handbook of Malayan Ferns (p. 506): "Variable, with the rhizome varying from short creeping to wide scandent, the stipes stramineous to black or purple brown, the fronds to 50 cm. long, the branches abruptly shortly acuminate to subcaudate, the leaflets $1\frac{1}{4}$ - $3\frac{1}{2}$ cm. long, pale to dark when dry." Admitting so much variation, I cannot see that it is possible to separate *L. scandens* as a distinct species.

We have here an instance of the variability of many fern species; it is shown by several of the Lindsayas. The only real test proving the specific identity of the various form would be to grow plants from spores borne on one frond, and try to produce all the growth forms from the same parent. I do not think that any one has attempted this task, at any rate with Malayan ferns. It has many difficulties, the chief of which is to exclude foreign spores from the experiment.

7. *Polypodium triangulare* Scort.

Polypodium triangulare Scort. was first found in Perak, and described and figured by Beddome in the Journal of Botany, 1887, p. 324, t. 278. There are several specimens collected by Scortechini in the Singapore Herbarium, all without locality, and also specimens collected by Wray (294) at 4500 ft. on Gunong Batu Puteh, and Kunstler (Larut 3647). Subsequently it has been found on

G. Kerbau at about 6000 ft. (Haniff 14739) and on G. Tahan at 5500 ft. (Haniff and Nur. 7980). It appeared that the description of Copeland's *Acrosorus exaltata* from the Philippines (Philippine Journal of Science Vol. 1 Suppl. 158) agreed closely with *Polypodium triangulare*, and through the kindness of Mr. E. D. Merrill, lately Director of the Bureau of Science, Manila, I have been enabled to examine a specimen of Copeland's fern. The two appear to be quite identical, and therefore the Philippine plant should be called *P. triangulare*, or *Acrosorus triangularis*, if Copeland's genus be adopted. (See also Phil. Journ. Sci. 3 C, 347).

There are in the Singapore Herbarium specimens of *P. triangulare* collected at Khao Luang in Lower Siam (Dr. E. Smith 725) and on Mt. Kinabalu in British North Borneo (by Major C. M. Enriquez, 18163 in Singapore Series). The species has thus a wide range of distribution in the Malayan region.

8. *Gleichenia Norrisii*.

This species was described by Kuhn in 1869; apparently from specimens collected by Griffith and Norris some years earlier in the Malay Peninsula. It was figured by Beddome in the Supplement to his *Ferns of British India*, tab. 346. It is closely allied to *G. glauca*, and incomplete herbarium specimens are not always easy to distinguish. When seen in the field, the distinction between the two species is at once apparent. *G. Norrisii* has a looser habit, with more distant pinnulae and broader more rounded segments; the distal pinnulae are also conspicuously bent backwards. It further lacks the long deeply divided stipule-like leaflets that surround the apical buds of the fronds of *G. glauca*, these being replaced by pairs of reduced pinnulae close to the bases of the pinnae which form the fork containing the bud.

In ascending Government Hill, Penang, one first meets *G. Norrisii* at about 1700 feet altitude, where it largely replaces *G. linearis* as the common fern in open places beside the road. It occurs from this altitude upwards to the top of the hill (2500 feet), but towards the top and on the slightly higher Western Hill *G. glauca* appears and is more abundant. *G. Norrisii* has also been found on the Taiping Hills at about 2000 feet (Scortechini 439), on Bukit Panchor in Province Wellesley (Ridley 12634), on G. Angsi at about 2000 feet (Holtum 9901), and at the same height on the top of G. Pulai in Johore (Ridley 12127). *G. glauca* appears to occur at somewhat higher altitudes (to at least 4000 feet) throughout the Peninsula, and has been more frequently collected.

9. *Lygodium polystachyum*.

Lygodium polystachyum Wall. is by far the most beautiful member of its genus occurring in the Malay Peninsula. It has

rather a restricted range, of which the southern limit appears to be in Upper Perak, though a specimen has been collected by Mr. Ridley at Kuala Tembeling in Pahang. It occurs in Penang and the Langkawi Islands, and Curtis records that it is abundant all over the Island of Puket in Lower Siam. Unlike the other species, it grows in the shade of the jungle, climbing up slender trees, and bears its fertile fronds in the shade. All the other local *Lygodiums* known to me are sun plants, or if they start life in the shade only flourish produce fertile pinnae in the open. The plants of *L. polystachyum* which have not yet produced climbing leaves have almost the appearance of a *Dryopteris*, and the basal pinnae of all fronds are very large. The texture also is much softer than in the other *Lygodiums*.

10. *Diplazium Ridleyi* (Copeland).

This species was described (as *Athyrium Ridleyi*) by Copeland in the Philippine Journal of Science, XI c, p. 39. The only distinction from *D. accedens* Bl. is in the presence of sterile areoles between adjacent rows of soriferous veins. Copeland also states that the rachis is smooth. The type collection, Ridley's 13970 from the Telom River, Pahang, is represented in the Singapore herbarium; with it is included a stipe which is covered with blunt spines. Probably no part of the stipe reached Copeland, as he does not mention it. Further, the upper pinnae and the distal portions of the lower ones lack the distinctive phenomenon of the sterile areoles separating the fertile veins. On comparison with other specimens from the Malay Peninsula it is seen that Ridley's Telom plant represents only an extreme form of a variable species. The following specimens all show the additional areoles at least at the bases of the pinnae, though none to such a marked extent as the type of *D. Ridleyi*: Burkill and Holttum 8730, Fraser Hill; Nur. 11083, Fraser Hill; Fox 10657, Maxwell's Hill; E. Smith 1924, Banang Sta, Patani. Considering the known variability of many species of *Diplazium*, it appears to me that these plants should all be reckoned as *D. accedens* Bl., or *D. proliferum* (Lam.) v. *accedens*.

I have lately seen at Buitenzorg, both in cultivation and in the herbarium, specimens of *D. permirabile* v.A.v.R. (*Bull. Jard. Bot. Buitenzorg*, Ser. 3, Vol. 5, p. 196), and it appears to me that these also should be included in the same species as the specimens above cited. The distinguishing feature of *D. permirabile* is the presence of scales at the apices of the spines on the stipes. The stipes of the herbarium specimens from the Peninsula above mentioned do not show these scales, but the blunt spines are exactly the same as in *D. permirabile*, and the absence of scales is to be ascribed to loss in the processes of drying and mounting. They are more easily lost than ordinary scales growing from the

surface of a stipe. There are plants from the Malay Peninsula in cultivation in the Singapore Gardens which bear scales exactly like those of *D. permirabile*.

11. *Schizoloma Walkerae*.

Schizoloma Walkerae (Hk.) Kuhn has hitherto been collected in the Malay Peninsula only on Mt. Ophir (no altitude recorded) and in Singapore. Mr. Ridley says that it grows in watery places. An additional locality can now be added, in the north of the Peninsula; I found this fern growing on Kedah Peak at an altitude of about 3000 feet above sea, amongst Sphagnum, by a small stream in the low forest.

12. *Dryopteris palcata* Copel.

This species was found on a specimen from Benkoelen in Sumatra. It occurs also in the Malay Peninsula, the other collections having been confused with *D. ferox*, which it resembles only in the extreme scabiness of stipe and rachis. The specimens known from the Malay Peninsula are as follows:

Gunong Angsi (N. Sembilan Holttum 9926, Nur s.n.; Bujong Malacca Ridley 9536; Penang, Ridley 7080, Curtis s.n.; Patani, E. Smith 1856.

The Peninsula specimens are somewhat more hairy than those I have seen from Sumatra. *D. persquamifera* v.A.v.R. from Celebes is closely allied.

13. *Polypodium insigne* Bl.

Beddome records this species from the Malay Peninsula, but cites no specimens; nor do any exist among the older collections represented in the Singapore Herbarium. Two specimens of Mr. Ridley's from Telom are however clearly referable to it; one is numbered 13978, the other unnumbered. They agree well with specimens from Sumatra and from Gunong Gedeh in Java, though somewhat thicker in texture than the latter. This species appears normally to grow on rocks in streams; Mr. Ridley's 13978 is labelled "Telom River," and its appearance suggests a creeping habit.

Two specimens have been collected at Fraser Hill, by Miss G. Hose (no. 9, 1919) and by Burkill and Holttum (8789). The latter was climbing a small tree in the jungle, at about five feet from the ground, and its leaves are thicker in texture than the Telom plants, with narrower segments. These features are probably the consequence of restricted water supply in an unusual habitat.

14. *Hypolepis Brooksia* v.A.v.R.

This species was described from Benkoelen in Sumatra (Bull. Jard. Bot. Buitenzorg, 2nd Series, XXVIII, 29, 1918), the writer remarking that it resembles *Dennstaedtia scandens* and *D. Moluccana*. It has been collected in the Malay Peninsula at Fraser Hill (Burkill and Holttum 8817, Holttum 11339) and Gunong Hijau (Haniff 9086) and is further represented in the Singapore Herbarium by a specimen from Brastagi in N. Sumatra (Holtum

